

MARTHIE VAN DER WALT

North-West University, South Africa

ERIKA POTGIETER

North-West University, South Africa

**DESIGN-BASED RESEARCH: MATHEMATICS TEACHERS'
PROFESSIONAL DEVELOPMENT AND LOW COST MATHEMATICS
LEARNING RESOURCES**

Abstract:

There is a shortage in South Africa on design principles for low cost (shoestring) materials for the under-resourced mathematics classroom that teachers can implement to make mathematics accessible and fun for their learners. This paper presents a two cycle - three phases each - Educational Design Research study (2016-2019) that resulted in the development of an innovative educational mathematics low cost kit for both teachers and learners. The phases - conceptualisation, design and development and evaluation - were embedded in a three-day ethno-mathematical professional development programme for in-service mathematics teachers. The research aims to describe (i) the Morabaraba game and puzzles (teaching 2-D geometry concepts), music with boomwhackers and fraction posters (teaching fraction concepts), and puppetry with examples of scripts for teaching different mathematical topics. Teachers' and researchers' reflections on the implementation of the resources informed the refinement of the design and development for the manufacturing of the Tshimologo ('a new beginning') Mathematics Shoestring Kit.

Keywords:

Boomwhackers;

Ethno-mathematics;

Morabaraba;

Professional development;

Puppetry

JEL Classification: I29, I24